

Two new Indo-Pacific species of the sand-eel genus *Yirrkala* (Anguilliformes: Ophichthidae)

John E. McCosker

California Academy of Sciences, San Francisco, California 94118
e-mail: jmccosker@calacademy.org

Received 18 August; accepted 5 October 2010

ABSTRACT. *Yirrkala ori* sp. nov., subfamily Ophichthinae, tribe Sphagebranchini, is described from specimens collected off Durban, KwaZulu-Natal, South Africa, in 20 m. It differs from all known congeners in having 4 supraorbital pores, in its colouration, and in its meristics and morphometrics. *Yirrkala calyptra* species novum is described from specimens collected in 18 m off Fraser Island, Australia. It differs from all known congeners in having 4 supraorbital pores, a distinctive black facial slash, and in its meristics and morphometrics.

RÉSUMÉ. L'espèce *Yirrkala ori*, la sous-famille d'Ophichthinae, groupe de Sphagebranchini, est décrite selon les échantillons pris à 20 m sur les côtes de Durban, au KwaZulu-Natal, en Afrique du Sud. La différence avec d'autres espèces réside dans le fait que cette espèce possède quatre pores supra orbitaux. Sa couleur, sa meristique et sa morphométrie font également sa différence. L'espèce *Yirrkala calyptra* novum est décrite à partir des échantillons pris à 18 m sur les côtes de l'Île de Fraser, en Australie. Cette espèce se caractérise par ses 4 pores supra orbitaux, la possession d'une fente faciale noire distinctive et aussi par sa meristique et sa morphométrie.

KEY WORDS: Ophichthidae, *Yirrkala ori* sp. nov., KwaZulu-Natal, South Africa, *Yirrkala calyptra* sp. nov., Australia.

INTRODUCTION

The marine sand-eel genus *Yirrkala* is currently known from about 12 species that range from the central Pacific to the western Indian Ocean and the Red Sea. They are primarily shallow-water substrate burrowers that occasionally appear in rotenone-based collections and trawl captures. Little is known of their biology and taxonomic problems remain unsolved. *Yirrkala* was described by Whitley to include *Y. chaselingi* Whitley (1940) and *Sphagebranchius lumbricoides* Bleeker (1865), and possibly *Dalophis anceps* Cantor (1849). McCosker (1977) expanded *Yirrkala* to include approximately 12 species and studied the osteology of *Y. lumbricoides*, *Y. misolensis*, *Y. moorei* and *Y. tenuis* in his revision of the Ophichthidae. On that basis he placed the species of *Yirrkala* within the tribe Sphagebranchini of the subfamily Ophichthinae, wherein it currently resides. Two additional species of *Yirrkala* have subsequently been described, *Y. insolitus* McCosker (1999) from off New Caledonia and *Y. moorei* McCosker (2006) from the Marquesas and American Samoa, and *Y. gellerupi* was redescribed by McCosker *et al.* (2007).

It is the purpose of this paper to describe two additional closely related new species of *Yirrkala* so that one of them will become available for the upcoming publication of the *Coastal Fishes of the Western Indian Ocean*.

MATERIALS AND METHODS

Measurements are straight-line, made either with a 300 mm ruler with 0.5 mm gradations (for total length, trunk length, and tail length) and recorded to the nearest 0.5 mm, or with dial calipers (all other measurements) and recorded to the nearest 0.1 mm. Body length comprises head and trunk lengths. Head length is measured from the snout tip to the postero-dorsal margin of the gill opening; trunk length is from the gill opening to mid-anus; maximum body depth does not include the median fins. Head-pore terminology follows that of McCosker *et al.* (1989: 257), such that the supraorbital pores are expressed as the ethmoidal pore + pores in supraorbital canal, i.e., 1 + 3, and the infraorbital pores are expressed as pores along the upper jaw + those in vertical part of the canal behind the eye (the 'postorbital pores'), i.e., 4 + 2, in that frequently the last pore included along the upper jaw is part of the postorbital series. Vertebral counts (which include the hypural) were taken from radiographs. The mean vertebral formula (MVF) is expressed as the means of predorsal, preanal, and total vertebrae counts (Böhlke 1982). Institutional abbreviations follow the Standard Symbolic Codes for Institutional Research Collections in Herpetology and Ichthyology (Leviton *et al.* 1985).

Genus *Yirrkala* Whitley 1940

Yirrkala Whitley 1940: 410 (type species *Y. chaselingi* Whitley 1940, by original designation).

Pantonora Smith 1964: 719 (type species *Ophichthys tenuis* Günther 1870, by original designation).

DIAGNOSIS. Elongate ophichthids, subfamily Ophichthinae, tribe Sphagebranchini (*sensu* McCosker 1977) with slender, cylindrical bodies, pointed at both ends; head and trunk equal to or slightly longer than tail; median fins very reduced in some species; dorsal-fin origin above or behind gill openings (behind anus in one species); pectoral fins absent; snout conical to sub-conical, flat on underside; anterior nostrils tubular; posterior nostrils within upper lip; teeth conical, mostly uniserial; two preopercular pores; gill openings low-lateral to ventral.

Yirrkala ori sp. nov.

Holotype: SAIAB 17485, 353 mm TL, female, South Africa, KwaZulu-Natal, Durban, Addington Beach (29°86'40"S, 31°05'00"E), collected by sand dredge in 20 m, ORI, August 1982.

Paratypes: SAIAB 96727, 414 mm TL, male, a damaged specimen; and CAS 230224, 313 mm TL, male, collected with the holotype. SAIAB 17284, 438 mm TL, male, South Africa, KwaZulu-Natal, 1 km off Durban bluff, 20 m.

DIAGNOSIS. An elongate species of *Yirrkala* with the unique combination of characters: head 6.2–6.7% TL; tail 50% TL; dorsal-fin origin nearly above gill openings; eye behind middle of upper jaw; 4 supraorbital pores; teeth conical, minute, uniserial on jaws and vomer; colouration yellowish, slightly darker dorsally; total vertebrae 149–152; and mean vertebral formula 6.5–74–150 (n=4).

Counts and measurements of the holotype (in mm). Total length 353; head length 23.8; trunk length 153.2; tail length 176; body depth at gill openings 5.9; body depth at anus 5.5; body width at gill openings 5.0; body width at anus 5.5; snout tip to origin of dorsal fin 22.2; snout length 3.6; upper-jaw length 6.4; tip of lower jaw to tip of snout 2.4; isthmus 1.1; left gill-opening length 2.2; eye diameter 1.0; interorbital distance 1.6. Total vertebrae 149; predorsal vertebrae 7; preanal vertebrae 71. Left lateral-line pores ~139.

DESCRIPTION. Body very elongate (Fig. 1), its depth at gill openings 57–67 times in TL; body and tail nearly cylindrical, tapering posteriorly to an acute, finless point. Head and trunk 2.0 and head 1.5–1.6 in TL. Snout tip acute, conical from above, flat on underside with a medial groove nearly to anterior edge of nostril. Lower jaw included, does not reach anterior-nostril edge. Anterior nostril nearly flush with snout, surrounded at base by a prominent groove; posterior nostril within inner edge of lip, not visible externally. Anterior edge of orbit behind middle of upper jaw.

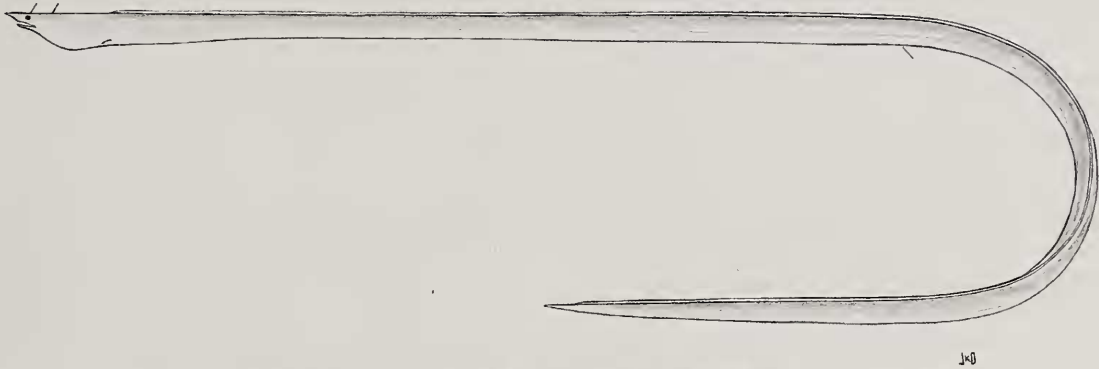


Fig. 1. Holotype of *Yirrkala ori* sp. nov., SAIAB 17485, 353 mm TL, female. Illustration by J. Olsson.

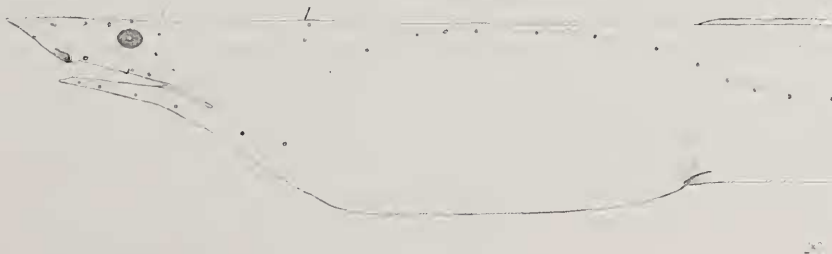


Fig. 2. Head of holotype of *Yirrkala ori* sp. nov., SAIAB 17485, 353 mm TL, female. Illustration by J. Olsson.

Median fins low but apparent. Dorsal fin arises above antero-ventral margin of gill opening. Gill openings low, their major axis nearly horizontal, without an anterior lateral membrane or duplication. Isthmus narrow, its width nearly 6 in gill-opening length.

Head pores reduced but visible (Fig. 2). Four mandibular, 2 preopercular, 1 ethmoidal + 4 supraorbital, 4 + 2 infraorbital, 5 temporal, and a single interorbital pores. Lateral-line pores minute and difficult to discern; ~139 total left lateral-line pores, 10 before the gill opening and 64 before the anus, the last pore 5.6 mm before the tail tip of the holotype.

Teeth (Fig. 3) small and conical, slightly recurved, uniserial in jaws. Intermaxillary teeth the largest, an inverted 'V' of 3 teeth partially exposed beneath snout, followed by a gap, then 2 linear and 2 pairs of smaller vomerine teeth, followed by 8 even-smaller uniserial teeth. Approximately 11–12 uniserial upper jaw teeth and 13–14 uniserial lower jaw teeth.

Body colouration in ethanol uniform yellowish, overlain along dorsal surface with a speckling of minute, brown punctations. Underside of snout also speckled with minute, brown punctations. Anterior nostrils pale. Suborbital, preopercular and temporal pores and first lateral-line pore circled by a fine dark line. Orbit of preserved specimens appears to be paler than surrounding area. Median fins pale, contrasting with body coloration. Peritoneum pale.

SIZE. The largest known specimen is 438 mm TL, a male.

ETYMOLOGY. Named in honour of the Oceanographic Research Institute of South Africa, which collected these and many other valuable specimens.

DISTRIBUTION. Known from the Durban region of KwaZulu-Natal, South Africa, found living in coarse sand at 20 m.

REMARKS. This new species differs from most of its congeners in having four supraorbital pores and an anterior dorsal-fin origin. Most other species of *Yirrkala* have a dorsal-fin origin beginning behind the gill openings (*Y. chaselingi*, *Y. gjellerupi*, *Y. insolitus*, *Y. maculata*, *Y. misolensis*, *Y. omanensis*, *Y. philippinensis*), and others (*Y. lumbricoides*, *Y. moorei* and *Y. tenuis*) have their dorsal-fin origin above or ahead of the gill openings (similar to that of the new species), however all possess three supraorbital pores. I compared the type specimens

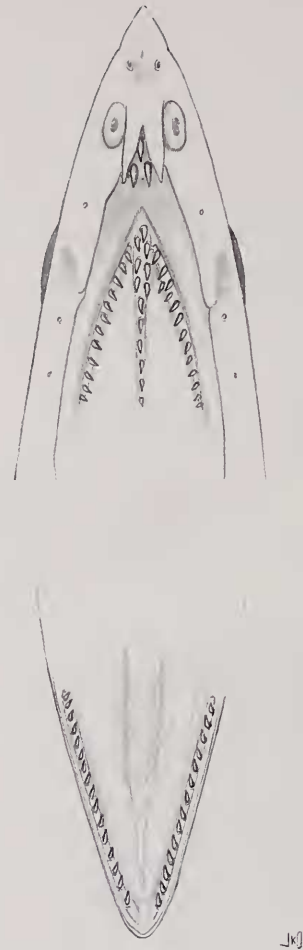


Fig. 3. Dentition of paratype of *Yirrkala ori* sp. nov., SAIAB 96727, 414 mm TL, male. Illustration by J. Olsson.

of the new species to the holotype (ANSP 55068) of *Caecula natalensis* Fowler 1934 [which I consider to be a junior synonym of *Y. tenuis* (Günther 1870)], also described from KwaZulu-Natal. *Yirrkala tenuis* differs in having three supraorbital pores, 167–174 vertebrae, and a deeper body (depth behind gill opening 41–45 in TL vs. 57–67). The most similar congener appears to be the new species of *Yirrkala* from Queensland, Australia, described herein. It differs from *Y. ori* by having a distinctive black facial slash, a slightly more posterior dorsal-fin origin and a slightly longer trunk and shorter tail (Table 1).

ADDITIONAL MATERIAL EXAMINED. *Caecula natalensis*: ANSP 55068, 303 mm TL, the holotype, from Umgeni, KwaZulu-Natal, South Africa.

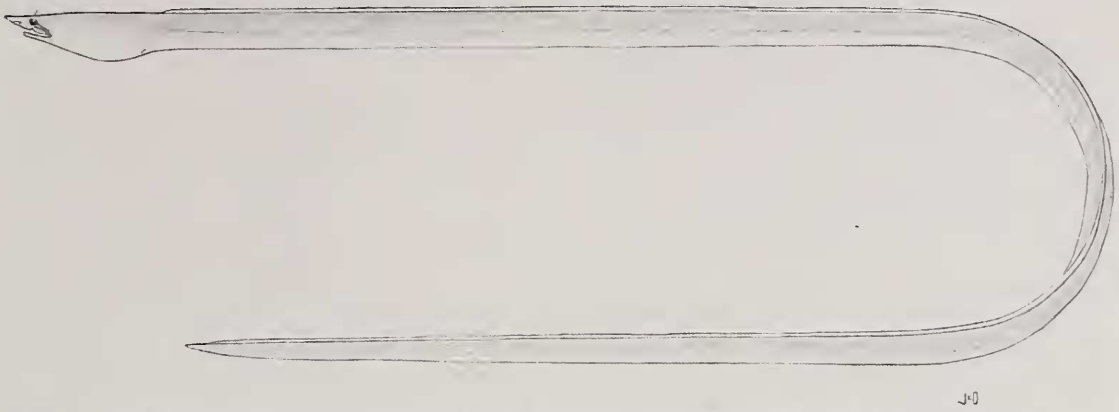


Fig. 4. Holotype of *Yirrkala calyptra* sp. nov., AMS I.45310-001, 395 mm TL, female. Illustration by J. Olsson.

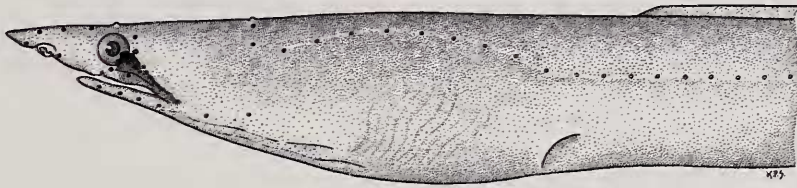


Fig. 5. Head of holotype of *Yirrkala calyptra* sp. nov., AMS I.45310-001, 395 mm TL, female. Illustration by K. Smith.

Yirrkala calyptra sp. nov.

Holotype. AMS I.45310-001, 395 mm TL, a gravid female, Australia, Queensland, Fraser Island, Platypus Bay (24°21'S, 152°30'E), between Moon Point and Rooney Point. Collected by Sir Thomas Riley at a depth of "probably 10 fathoms" (~18 m), Dec. 1971.

Paratypes (all collected with the holotype): AMS I.17454-002, 242 mm TL, male; CAS 41667, 358 mm TL, a mature male; BPBM 33916, 314 mm TL, a gravid female.

DIAGNOSIS. An elongate species of *Yirrkala* with the unique combination of characters: head 6.3–6.6% of total length (TL); tail 46–49% of TL; dorsal-fin origin nearly above gill openings; eye behind middle of upper jaw; 4 supraorbital pores; teeth conical, minute, uniserial on jaws and posteriorly on vomer; coloration yellowish, slightly darker dorsally, a distinctive black band from rear of orbit to rictus; total vertebrae 144–147; and mean vertebral formula 7–75–146 (n=4).

Counts and measurements of the holotype (in mm). Total length 395; head length 26.0; trunk length 181.5; tail length 187.5; body depth at gill openings 6.5; body depth at anus 5.9; body width at gill openings 6.0; body width at anus 5.5; origin of dorsal fin 26.2; snout length 3.7; upper jaw length 7.5; isthmus 1.2; left gill opening length 2.8; eye diameter 1.3; interorbital distance 2.0.



Fig. 6. Dentition of paratype of *Yirrkala calyptra* sp. nov., CAS 41667, 358 mm TL, male. Illustration by J. Olsson.

Total vertebrae 144; predorsal vertebrae 8; preanal vertebrae 73.

DESCRIPTION. Body very elongate (Fig. 4), its depth at gill openings 48–61 in TL, tapering posteriorly to an acute finless point. Body and tail nearly cylindrical. Head and trunk 1.9–2.0 and head 15.2–15.9 in TL. Snout acute at tip, conical from above, flat on underside and grooved medially to center of nostrils. Lower jaw included, extends nearly to anterior nostril. Anterior nostril slightly tubular; posterior nostril visible externally as a slit beneath the center of the eye. Center of eye at middle of upper jaw.

Median fins low but apparent. Dorsal fin arises slightly behind dorsal end of gill opening. Gill openings low, their major axis nearly horizontal, without an anterior lateral membrane or duplication. Isthmus narrow, much less than gill opening.

Head pores reduced but visible (Fig. 5). Four mandibular, 2 preopercular, 1 ethmoidal + 4 supraorbital, 4 + 2 infraorbital, 5 temporal, and a single interorbital pores. Lateral-line pores minute and difficult to discern, 10 before the gill opening. Teeth (Fig. 6) small and conical, uniserial in jaws. Intermaxillary teeth the largest, 3 as an inverted 'V' and partially exposed beneath snout, followed by a short gap and 3 pairs of smaller vomerine teeth, followed by 7 smaller uniserial teeth.

Approximately 11 uniserial upper jaw teeth and 22–23 small close-set lower jaw teeth.

Body colouration in ethyl alcohol yellowish; snout, chin, anterior nostrils, inside of mouth and peritoneum pale; overlain with a fine dusting of brown punctuations on cheeks, forehead, above the gill basket, and above the lateral line. A thin, slightly darker mid-dorsal band flanks the transparent dorsal fin. Anal fin transparent. A black mark extends from the lower hind edge of the eye to the rictus (Fig. 5).

SIZE. The largest known specimen is 395 mm, a gravid female.

ETYMOLOGY. From the Greek *καλύπτρα* (a noun in apposition), a veil, in reference to its facial colouration.

DISTRIBUTION. Known only from the type series from Queensland, Australia.

REMARKS. The new species differs from all known species of *Yirrkala* in its facial coloration, as well as a combination of its meristic and morphological characters. It is most closely related to those species of *Yirrkala* with four, rather than three, supraorbital pores. It is identical in its cephalic pore condition to that of *Y. ori* (described herein) but differs in its facial coloration and in having a slightly more posterior dorsal-fin origin and a slightly longer

Table 1. Proportions (in thousandths) and counts of the holotype and 2 paratypes of *Yirrkala ori* (the 414 mm paratype is not included except for its vertebral count) and the holotype and 3 paratypes of *Y. calyptra*. Abbreviations are: TL = total length; HL = head length; DFO = dorsal-fin origin; IO = interorbital width; GO = gill opening length.

	<i>Yirrkala ori</i>		<i>Yirrkala calyptra</i>	
	Mean	Range	Mean	Range
TL (mm)	313–438		242–395	
Head/TL	65	62–67	64	63–66
Trunk/TL	430	426–434	459	446–473
Tail/TL	500	499–502	480	464–490
Depth/TL	17	15–18	18	17–20
DFO/TL	59	54–63	98	92–102
Snout/HL	153	145–161	146	142–157
Upper jaw/HL	278	266–299	285	262–306
Eye/HL	45	42–47	55	50–60
IO/HL	76	69–89	83	77–90
<i>Vertebrae</i>				
Predorsal	6.5	6–7	8	7–9
Preanal	74	71–76	74	73–75
Total	150	149–152	145	143–147

trunk and shorter tail (Table 1). It is also similar to *Y. chaselingi* Whitley (1940), known from Queensland and Northern Australia, which lacks the distinctive black facial colouration, has slightly more vertebrae (150–155, n=3), and a slightly more anterior dorsal-fin origin, and appears to have three rather than four supraorbital pores.

ADDITIONAL MATERIAL EXAMINED. *Yirrkala chaselingi*: AM IB 481, 610 mm TL, holotype of *Yirrkala chaselingi*, from Caledon Bay, W shore of Gulf of Carpentaria, Australia; AM IA 16190-601, 2 (560 & 615 mm TL), paratypes of *Yirrkala chaselingi*, collected with the holotype; AMS I.20781-004, 147 mm TL, Lizard Island, Queensland, Australia.

ACKNOWLEDGMENTS

I wish to thank Phil Heemstra (SAIAB) and Doug Hoese and Mark McGrouther (AMS) for making the type specimens available. I also thank the staffs of the California Academy of Sciences (CAS), the South African Oceanographic Research Institute (ORI), the South African Institute for Aquatic Biodiversity (SAIAB), the Australian Museum (AMS), the Academy of Natural Sciences of Philadelphia (ANSP), the Natural History Museum (BMNH), and the Bernice P. Bishop Museum (BPBM), for advice and assistance with specimens. Illustrations were prepared by Juliana Olsson and Katharine P. Smith. I also thank Tomio Iwamoto (CAS) for reading a draft of this manuscript and Don Linker and the Jewish Community Endowment Fund for their financial support of the artists.

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